

CLAIMS:

1. A tube pump comprising:

a flexible tube in which a fluid passage is formed;

5 an accommodating case for accommodating the flexible tube, the tube extending along an inner wall of the case, the inner wall having an opening, the tube extending to the exterior of the case through the opening, the tube having a first portion and a second portion, which are located close to  
10 each other in the vicinity of the opening;

a pressing member revolving in the accommodating case, the pressing member moving from the first portion to the second portion along the flexible tube while pressing and squeezing a portion of the tube against the inner wall of the  
15 case, thereby enabling a fluid to flow from the first portion to the second portion in the fluid passage; and

an auxiliary member provided in the vicinity of the opening of the accommodating case, the auxiliary member having an auxiliary surface, the auxiliary member transferring the  
20 pressing member from the second portion to the first portion via the auxiliary surface when the pressing member passes the vicinity of the opening of the case.

2. The tube pump according to Claim 1, wherein, at least  
25 when the auxiliary surface receives the pressing member from the second portion or passes the pressing member to the first portion, the auxiliary surface is connected smoothly with a portion of an outer circumferential surface of the flexible tube spaced from the inner wall.

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3. The tube pump according to Claim 1, wherein the inner wall has a substantially circular shape.

4. The tube pump according to Claim 1, wherein the pressing  
35 member revolves around a revolution axis and the inner wall is

formed around the revolution axis.

5. The tube pump according to Claim 1, wherein the flexible tube includes a first extending portion extending from the first portion to the exterior of the accommodating case and a second extending portion extending from the second portion to the exterior of the case, and the pressing member decreases the pressure in the first portion to draw the fluid to the passage through the first extending portion and discharge the fluid through the second extending portion.

6. The tube pump according to Claim 1, wherein the auxiliary member is located between the first portion and the second portion.

7. The tube pump according to Claim 1, wherein the auxiliary member is formed from an elastic material.

8. The tube pump according to Claim 7, wherein the resilient force of the auxiliary member is selected such that a reactive force of the flexible tube and the auxiliary member acting on the pressing member remains constant when the pressing member passes the vicinity of the opening.

9. The tube pump according to Claim 7, wherein, when the auxiliary surface is free from the pressing force of the pressing member, the auxiliary surface extends substantially parallel with a plane that is extended from the inner wall of the accommodating case at the opening, and the auxiliary surface is located inward of the extended plane in the case.

10. The tube pump according to Claim 7, wherein the auxiliary member is fixed to the accommodating case.

11. The tube pump according to Claim 1, wherein:

the auxiliary member is capable of pivoting in a first direction or in a second direction opposed to the first direction; and

5 wherein the auxiliary member pivots in the second direction when the pressing member proceeds from the second portion to the auxiliary surface, and in the first direction when the pressing member proceeds from the auxiliary surface to the first portion.

10 12. The tube pump according to Claim 11, wherein the auxiliary member is pivotally supported by the accommodating case.

15 13. The tube pump according to Claim 11, wherein: the pressing member revolves around the revolution axis; the auxiliary member pivots around a pivot axis; when the pressing member moving along the auxiliary surface is located closer to the first portion with respect to a line connecting the revolution axis with the pivot axis, the auxiliary member  
20 pivots to press the first portion is pressed; and when the pressing member moving along the auxiliary surface is located closer to the second portion with respect to the line, the auxiliary member pivots to press the second portion.

25 14. The tube pump according to Claim 11, wherein: when the auxiliary member presses the second portion with the pressing member moving along the auxiliary surface, the auxiliary surface is connected smoothly with an outer circumferential surface of the second portion; and, when the auxiliary member  
30 presses the first portion with the pressing member moving along the auxiliary surface, the auxiliary surface is connected smoothly with an outer circumferential surface of the first portion.

35 15. The tube pump according to Claim 11, wherein, when the

pressing member is separated from the auxiliary member, the auxiliary member moves in a direction to suspend pressing of the flexible tube.

5 16. The tube pump according to Claim 1, wherein: the auxiliary member is movable toward or away from the opening; and when the pressing member contacts the auxiliary surface the auxiliary member moves toward the opening and presses at least one of the first and second portions.

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17. The tube pump according to Claim 16, wherein the auxiliary member is slidably supported by the accommodating case.

15 18. The tube pump according to Claim 16, wherein the auxiliary member is movable with the auxiliary surface held in a state parallel with a plane extended from the inner wall of the accommodating case at the opening.

20 19. The tube pump according to Claim 16, wherein, when the pressing member is separated from the auxiliary surface the auxiliary member moves away from the opening for suspending the pressing of the flexible tube.

25 20. The tube pump according to Claim 1, wherein the auxiliary member has a substantially triangular cross-sectional shape and includes a first surface opposing the first portion, a second surface opposing the second portion, and the auxiliary surface.

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21. The tube pump according to Claim 20, wherein the first and second surfaces are concave curved surface.

22. The tube pump according to Claim 1, wherein a portion of  
35 the flexible tube accommodated in the accommodating case forms

an  $\Omega$  shape.

23. The tube pump according to Claim 1, wherein the pressing member revolves around the revolution axis, wherein the flexible tube does not have overlapped portions in the accommodating case with respect to the revolution axis..

24. A liquid injection apparatus comprising:

a head injecting a liquid;

10 a cap defining a sealed space with the head; and

a tube pump, wherein the tube pump includes:

a flexible tube in which a fluid passage is formed;

an accommodating case for accommodating the

15 flexible tube, the tube extending along an inner wall of the case, the inner wall having an opening, the tube extending to the exterior of the case through the opening, the tube having a first portion and a second portion, which are located close to each other in the vicinity of the opening;

20 a pressing member revolving in the accommodating case, the pressing member moving from the first portion to the second portion along the flexible tube while pressing and squeezing a portion of the tube against the inner wall of the case, thereby enabling a fluid to flow from the first portion to the second portion in the fluid passage; and

25 an auxiliary member provided in the vicinity of the opening of the accommodating case, the auxiliary member having an auxiliary surface, the auxiliary member transferring the pressing member from the second portion to the first portion via the auxiliary surface when the pressing member passes the vicinity of the opening of the case,

30 wherein the tube pump connects a portion of the flexible tube extending from the first portion to the

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exterior of the accommodating case with the sealed space,  
thereby drawing liquid from the head.